MATERIAL SAFETY DATA SHEET

SRM Supplier: **National Institute of Standards and Technology**
Standard Reference Materials Program
100 Bureau Drive, Stop 2320
Gaithersburg, Maryland 20899-2320

SRM Number: 640c
MSDS Number: 640c
SRM Name: Silicon Powder, Line Position and Line Shape Standard for Powder Diffraction
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MSDS Coordinator: Mario J. Cellarosi
Phone: (301) 975-6776
ChemTrec: 1-800-424-9300

FAX: (301) 926-4751
E-mail: SRMMSDS@nist.gov

SECTION I. MATERIAL IDENTIFICATION

Material Name: Silicon Powder, Line Position and Line Shape Standard for Powder Diffraction

Description: SRM 640c is a high purity electronic grade silicon powder with a median particle size of 4.9 µm. A unit of SRM 640c consists of approximately 7.5 g of silicon powder bottled under argon.

Other Designations: Silicon Powder (silicon; silicon powder, amorphous)

Name	Chemical Formula	CAS Registry Number
Silicon	Si	7440-21-3

DOT Classification: Silicon Powder, Amorphous UN1346

SECTION II. HAZARDOUS INGREDIENTS

Hazardous Component	Nominal Concentration (%)	Exposure Limits and Toxicity Data
Silicon	100	OSHA TWA (Respirable Fraction): 5 mg/m^3
		OSHA TWA (Total Dust): 15 mg/m^3
		ACGIH TWA (Total Particulate): 10 mg/m^3
		NIOSH TWA (Respirable Fraction): 5 mg/m^3/10 h
		NIOSH TWA (Total Particulate): 10 mg/m^3/10 h

SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Silicon	
Appearance and Odor: an odorless, grey to black lustrous powder	**Melting Point (°C):** 1410
Atomic Weight: 28.09	**Boiling Point (°C):** 2355
Specific Gravity (Water = 1): 2.33	**Solubility in Water:** insoluble
	Solvent Solubility: soluble in molten alkali oxides, hydrofluoric/nitric acid mixtures, molten metals, and germanium; insoluble in hydrofluoric acid, nitric acid, hydrochloric acid, and organic solvents

SECTION IV. FIRE AND EXPLOSION HAZARD DATA

Flash Point: Not Applicable **Method Used:** Not Applicable **Autoignition Temperature:** Not Applicable

Flammability Limits in Air (g/m^3): **UPPER:** Not Applicable
LOWER: 160

Unusual Fire and Explosion Hazards: This material is a negligible fire hazard in bulk form. However, dust/air mixtures may ignite or explode.

Silicon with aluminum or lead oxide may explode on heating; strong oxidizers with this material are a fire and explosion hazard. Bromine trifluoride or chlorine trifluoride with silicon can cause an ignition reaction; with gaseous chlorine, ignition will occur on contact at ambient temperatures. Silicon with water, at sufficiently high temperatures and pressures, will form a combustible or explosive reaction. Fluorine, when mixed with silicon, ignites at room temperature, and the heat of this combustion will attain temperatures above 1400 °C. The addition of silicon to sodium-potassium alloy will form sodium silicide, which is spontaneously flammable in air. Silicon with peroxyformic acid and traces of manganese dioxide may promote oxidation with ignition.

Extinguishing Media: Use dry sand, dolomite, graphite, sodium chloride, soda ash, or dry powder for metal fires. **DO NOT** use water directly on material.

Special Fire Procedures: Fire fighters should wear self-contained breathing apparatus (SCBA) and protective clothing when fighting fires involving materials of this type.

SECTION V. REACTIVITY DATA

Stability: __X__ **Stable** _____ **Unstable**

Silicon is stable at normal temperatures and pressure

Conditions to Avoid: Avoid generating dust. Avoid heat, sparks, open flames, and incompatible materials.

Incompatibility (Materials to Avoid): Avoid contact and keep separated from halogens, metal carbide, metals, oxidizing materials, metal salts and acids.

See Section IV: *Fire and Explosion Hazard Data*

Hazardous Decomposition or Byproducts: Thermal decomposition products may include toxic oxides of silicon.

Hazardous Polymerization: _____ **Will Occur** __X__ **Will Not Occur**

SECTION VI. HEALTH HAZARD DATA

Route of Entry: __X__ **Inhalation** ____ **Skin** __X__ **Ingestion**

Health Hazards (Acute and Chronic): Skin and eye exposure to silicon can cause mechanical irritation. Inhalation of dust particles may cause respiratory and mucous membrane irritation. Repeated or prolonged inhalation exposures may cause excessive production of mucous, mucous gland hypertrophy, and increased airway resistance and may contribute to chronic bronchitis. Nephrotoxicity has been demonstrated with excessive exposure to silicon.

Signs and Symptoms of Exposure: Skin irritation and excessive mucous production

Medical Conditions Generally Aggravated by Exposure: None reported

Listed as a Carcinogen/Potential Carcinogen:

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens		X
In the International Agency for Research on Cancer (IARC) Monographs		X
By the Occupational Safety and Health Administration (OSHA)		X

EMERGENCY AND FIRST AID PROCEDURES:

Skin Contact: Remove contaminated shoes and clothing. Rinse affected area with large amounts of water followed by washing the area with soap and water. Obtain medical assistance if necessary.

Eye Contact: Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Obtain immediate medical attention.

Inhalation: If inhaled, move the victim to fresh air. If breathing is difficult, give oxygen; if the victim is not breathing, give artificial respiration by qualified personnel. Obtain medical assistance.

Ingestion: If ingestion occurs, wash out mouth with water. Obtain medical assistance.

TARGET ORGAN(S) OF ATTACK: Skin and upper respiratory tract.

SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case Material Is Released or Spilled: Notify safety personnel of major spills and/or leaks. Shut off sources of ignition. Evacuate all nonessential personnel. Avoid generating dust. Recover spills with a clean shovel and place into a clean, dry container for appropriate disposal. Clean up remaining residue using a high efficiency particulate filter vacuum.

Waste Disposal: Follow all federal, state, and local regulations governing disposal.

Handling and Storage: Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits. Splash-proof or dust-resistant safety goggles should be worn. An emergency eye wash fountain and quick drench shower should be readily accessible. Protective gloves and clothing are recommended.

NOTE: Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

Store material in a cool, dry, well ventilated area away from flames, sources of ignition, and incompatible materials.

SECTION VIII. SOURCE DATA/OTHER COMMENTS

Sources: MDL Information Systems, Inc., MSDS *Silicon*, 18 September 2003.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified value for this material is given in the NIST Certificate of Analysis.